NE German Lowland Observatory

The Northeastern Lowland observatory (TERENO NE) is situated in a region shaped by recurring glacial and periglacial processes at least half a million years. Within this period, three major glaciations covered the entire region. The last time this happened approximately 25 – 15 ka ago (Weichselian glaciation). Since that time, a young morainic landscape developed. In 1999/2000 soil moisture from hyperspectral & radar-RS data. The present climate is characterized by rather low annual precipitation between 550 and 650 mm/a. Particularly, this rather low annual precipitation in combination with major reconfigurations of the hydrological system (draining and drainage) in historic times makes this region highly sensitive with regard to climate change impacts.

The test site DEMMIN (Durable Environmental Multidisciplinary Monitoring Information Network(s)) one of four test areas of the TERENO NE Lowland observatory. In 1999/2000 DEMMIN was founded as a cal./val. test site by the German Aerospace Center (DLR) and the Community of Interests (IG Demmin). Since 2004 an automated agrarian meteorological network with 20 weather stations was installed. In 2009 the test site DEMMIN joined the TERENO NE Lowland observatory.

Main goals of this cooperation is the modeling of evapotranspiration from remote sensing (RS) data with meteorological data and observation of soil moisture from hyperspectral & radar-RS data.

Activities and Results in 2012

The instrumentation of the test site DEMMIN has been started in December 2011.

A) Automated agrarian meteorological network

Monitoring and mapping of the variation of agrarian-meteorological parameters in a landscape area of 30 km x 30 km

- Continuing construction of the automated agrarian meteorological network to 40 gauging stations (20 DLR, 20 GFZ) in 2012: Analyzed parameters are precipitation, solar radiance, thermal emission, wind speed & wind direction, air temperatures & air moisture, soil temperature & soil moisture at different depths with a logging interval of 15 minutes.

B) Soil moisture measuring network and soil analysis

Monitoring and mapping of soil moisture variability in the vadose zone under agricultural land use with different arable crops & soil texture types

- Documentation of soil characteristics in 64 soil profiles (~1 m depth) at location of soil moisture gauging stations: Physical and chemical soil analysis are planned for 2013.

- Installation of 33 soil moisture stations in 2012: In total 64 stations are planned until April 2013. Each station with 6 SPADE sensors based on the frequency domain reflectometry method (FDR), continuous hourly measurements at 50 cm and 70 cm depths.

C) Remote sensing

Continuous observation of vegetation parameters and spectral characteristics on 25 agricultural and 1 forestal locations

- Airborne based radar and hyperspectral RS operations (May 2012): Simultaneous surveying flights over arable land with different crops in conjunction with ground truth surface and soil measurements are used for process development of soil moisture determination from both data systems.

- Airborne based thermal and hyperspectral RS operations in cooperation with BGR (August 2012): Vegetation and arable soil characteristics in their daily variations were analyzed in visible (VIS), near infrared(NIR) and short wave infrared (SWIR) spectral range by using hyperspectral sensors and in thermal infrared (TIR) by thermal sensor.

- Analyses of soil and plant parameters on agricultural sites: For TerraSAR-X and RapidEye time series interpretation surface characteristics were documented every eleven days.